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FACTORS INFLUENCING THE SUPPLY OF DOMESTICALLY PRODUCED RICE IN KATSINA STATE

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ABSTRACT

This research analyzed the various factors that affect the supply of domestically produced rice in selected Local Government Areas of Katsina State. A combination of purposive and random sampling methods was utilized. Four local government areas (LGAs)—Daura, Dutsin-ma, Funtua, and Katsina—were selected deliberately based on their accessibility. Within each of these LGAs, one market was specifically chosen. The selected marketplaces included Daura Main Market in Daura LGA, Dutsin-ma Main Market in Dutsin-ma LGA, Jabiri Market in Funtua LGA, and Central Market in Katsina LGA. From a total population of 240 retailers and 120 wholesalers across the four markets, 42% of the retailers and 48% of the wholesalers were randomly selected from each of the designated marketplaces. Ultimately, 101 retailers and 58 wholesalers were randomly chosen, resulting in a total of 159 respondents. Enumerators were trained thoroughly before being assigned to each market. The sample size was determined to ensure adequate representation from each group, facilitating effective generalization of the study's findings. The data collected were examined using regression analysis and elasticity coefficients. The supply of local rice was significantly impacted by the prices of rice, maize, sorghum, and marketing costs. An own price elasticity coefficient of 0.49 indicated that the supply of local rice is price inelastic. The cross-price elasticity coefficients for foreign rice and sorghum were 2.09 and 4.08, respectively, showing that these commodities serve as substitutes for local rice. The study highlighted several challenges in rice marketing within the area, including insufficient credit facilities, low prices, inadequate storage facilities, and non-standardized measurement units.

1.0 Introduction

Rice holds a vital role in achieving food and nutrition security in Nigeria, as it is a primary staple food in the country. While rice is cultivated across various regions, rapid population growth, urban development, and shifts in consumer preferences over the last decade have hindered local production from satisfying demand Omoare and Oyediran (2017). The escalating costs associated with rice imports have prompted the Federal Government of Nigeria to promote domestic production by creating a conducive environment for the growth of a robust rice sector, attracting both local and foreign investments. A primary objective for the Nigerian Government and major rice stakeholders is to improve local rice production to meet national demand.

Significant resources have been allocated to the development of the rice sub-sector from both public and private entities over the past ten years. Despite notable advancements,

local production still does not meet the country's needs, presenting a critical issue that must be addressed to achieve the nation's self-sufficiency objectives (Federal Ministry of Agriculture and Natural Resources (FMANR), 2023).

Rice is among the most widely consumed staples in Nigeria, with a per capita consumption of 32kg. Over the last decade, consumption has surged by 4.7%, nearly quadrupling the global consumption growth rate, reaching 6.4 million tonnes in 2017, which accounts for 20% of Africa's total consumption. According to Nigeria's rice statistics, there exists substantial potential for productivity enhancement and increased output. Current yields remain at 2 tonnes per hectare, approximately half of the average achieved in Asian countries (Price Water House Coopers (PwC), 2022).

Nigeria's rice output grew from 3.7 million metric tons in 2017 to 4.0 million metric tons in 2018. Nevertheless, Nigeria only locally produces 57 percent of the 6.7 million metric tons of rice consumed annually, resulting in a shortfall of about 3 million metric tons, which is either imported or illicitly smuggled into the country. To encourage local production, the Government implemented a ban on rice imports in 2019 (Federal Office of Statistics, 2023).

Effective marketing functions are essential for all economic systems aiming to enhance production and productivity. As such, agricultural marketing is a crucial sector within agriculture, significantly influencing the types of agricultural practices in the region, farmers' income levels, and the community's economic health, among other aspects. The low productivity in Katsina State's rice industry has persisted despite the state's fertile land, rising rice demand, and the federal government's and Katsina State's involvement through various programs and policies. The value chain, comparative advantage, competitiveness, and other factors have been the main subjects of numerous research on rice in the state. Nevertheless, no studies have been conducted to examine the variables affecting Katsina State's supply of rice grown locally. In order to bridge this growing knowledge gap, the research is required.

2.0 Literature review

Rahman (2012) estimated the productivity of rice by farm size and analyzed economic growth in Bangladesh using a stochastic frontier approach. The findings revealed that larger farms had the highest productivity, while small farms generated the greatest gross returns, and marginal farms achieved the highest net returns. Khai (2011) conducted a study to assess the technical efficiency of rice production in Vietnam and its determinants through the stochastic frontier analysis method using the Cobb-Douglas production function. They identified that intensive labor, irrigation, and education were the key factors positively influencing technical efficiency, which was estimated at around 82%.

The study suggested that utilizing both existing and new modern technologies could lead to increased output and reduced costs. Short, Mulinge, and Witwer (2010) performed a study focusing on trade and agricultural competitiveness regarding wheat and rice production in Kenya, utilizing value chain analysis. They pointed out several inefficiencies within the rice value chain, including high labor costs, significant rural-urban migration, and waterborne diseases. Additionally, they observed that the costs of fertilizers, chemicals, and seeds were elevated, while yields were low, and changing weather patterns had diminished the amount of water available for irrigation schemes. Omoare and Oyediran (2017), discussing the issue of rice importation, argued that importing rice is an inefficient use of foreign exchange, given the country's comparative advantage in rice production, and the financial losses associated with these imports represent a substantial decline in income and employment opportunities.

Nevertheless, WARDA (2022) noted that in Nigeria, the quality and standardization of rice are still developing, largely because rice processing and milling occur mainly at the cottage level. Omoare and Oyediran (2017) proposed that rice farmers in Gombe State and Niger, Nigeria, should focus on value addition to improve their income from rice cultivation, seek loans from commercial banks to expand their operations, and invest in processing equipment through their associations. They underscored the necessity for the government to enhance basic rural infrastructure and provide incentives. Kebede (2011) indicated that significant growth in rice production could be achieved through the application of new technologies and improvements in the production environment. Therefore, embracing various technologies would result in considerable increases in output. Additionally, according to Damola (2010), the challenges faced in rice production include the absence of effective rice development policies, insufficient irrigation, low adoption of farming technologies, inadequate agricultural inputs, delays in the distribution of improved seeds, weak agricultural extension services, and poor access to institutional credit.

Akande [2018] noted that insufficient knowledge regarding herbicide and pesticide usage, postharvest management, processing and marketing, pest and disease control, soil fertility practices, irrigation, water management, and harvesting techniques are significant challenges faced by rice farmers. The Food and Agriculture Organization (FAO,2023) emphasized the labor-intensive nature of activities like ploughing, planting, weeding, harvesting, threshing, and transportation, which are particularly challenging due to the lack of suitable tools and equipment for rice farming. Additionally, the available equipment is often too costly for the average farmer. Many farmers rely on basic, labor-intensive hand tools such as hoes, slashers, sickles, axes, and rakes for various agricultural tasks. Other issues include the lack of industrial development caused by ineffective government policies and high production cost (FAO,2023).

3.0 Methodology

3.1 The Area of Study

Katsina State serves as the study location. The state is positioned between longitudes 11° and 13° East of the Greenwich meridian, and latitudes 6° and 9° North of the equator. It encompasses a total land area of 23,938 square kilometers, with a projected population of 10,368,500 according to the National Population Commission of Nigeria and the National Bureau of Statistics (NPC & NBS, 2022). The state borders Kaduna to the south, the Niger Republic to the north, Zamfara to the west, and Jigawa and Kano States to the east (KTS official website, 2022). The climate in Katsina State typically varies with the seasons. Mornings are generally cool, afternoons are hot, and evenings turn cool again. The Harmattan season, lasting from November to February, is often cooler, windy, and dusty due to the northeast trade winds (KTS official website, 2022). The state has approximately 863,000 farming families and a cultivated land area of 1.64 million hectares (KTS official website, 2022). The primary crops grown include cotton, cowpea, sorghum, millet, groundnut, rice, maize, wheat, and various vegetables. Livestock such as cattle, sheep, goats, and poultry are also raised. Furthermore, Katsina State is endowed with agro-industrial facilities such as flour mills, cotton processing companies, cotton ginneries, and oil mills. The predominant ethnic groups in the area are Hausa and Fulani, though other Nigerians also reside here. Farming is the main occupation of the residents. Approximately 82% of the local population are farmers mainly operating on a small scale, with an average farm size ranging from 1 to 2 hectares (KTS official website, 2022). A combination of purposive and random sampling methods was utilized. Four local government areas (LGAs)—Daura, Dutsin-ma, Funtua, and Katsina—were selected deliberately based on their accessibility. Within each of these LGAs, one

market was specifically chosen. The selected marketplaces included Daura Main Market in Daura LGA, Dutsin-ma Main Market in Dutsin-ma LGA, Jabiri Market in Funtua LGA, and Central Market in Katsina LGA. From a total population of 240 retailers and 120 wholesalers across the four markets, 42% of the retailers and 48% of the wholesalers were randomly selected from each of the designated marketplaces. Ultimately, 101 retailers and 58 wholesalers were randomly chosen, resulting in a total of 159 respondents. Enumerators were trained thoroughly before being assigned to each market. The sample size was determined to ensure adequate representation from each group, facilitating effective generalization of the study's findings

Data were gathered from both primary and secondary sources. The collected data were analyzed using descriptive statistics and multiple regression analysis. Multiple regression analysis was utilized to examine the relationship between the supply of local rice (Y), the dependent variable, and five explanatory variables (Price of local rice X1, price of imported rice X2, price of maize X3, price of sorghum X4 and cost of marketing X5). The multiple regression analysis employed was of the following form.

a. The linear model.

$$Y = a + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + \mu_i \quad (1)$$

Where;

Y = Quantity of locally rice supply (100kg bag)
X_1 = Retail price of locally supplied rice (Naira per bag)
X_2 = Price of imported rice (Naira per bag)
X_3 = Price of Maize (Naira per bag)
X_4 = Price of sorghum (Naira per bag)
X_5 = Cost of marketing (Naira per bag)
a = Constant term
b = Parameter estimate, and
μ_i is the error term.

4.0 Results and Discussion

Determinants of Locally Supplied Rice: The necessity for boosting the supply of rice, one of the most commonly consumed cereal crops globally, cannot be overstated (Todaro, 2022). Thus, enhancing rice supply presents one of the challenges faced by numerous developing economies. This study posited that the supply of local rice is affected by factors such as the price of the product, prices of substitute products, and marketing costs. According to Adekanye (2014), the total amount of agricultural goods available for sale in a specific market over a certain timeframe is affected by the commodity's price, the prices of competing products and input purchases, the size of the agricultural labor force, and production technology. Table 1 illustrates the relationships between the dependent variable and the independent variables. The F-value demonstrates that the association between the dependent variable and the independent variables was significant at the 10% level. Two variables— Price of imported rice (X1), and price of sorghum (X3)— exhibited positive coefficients, indicating a positive impact on the supply of local rice. Nonetheless, only the price of imported rice (X2) and the price of sorghum (X3) were deemed significant at the 5% level. Conversely, price of local rice (X2), the price of maize (X4) and the cost of inputs (X5) showed negative coefficients, suggesting a negative effect on the supply of local rice. Both the prices of maize (X4) and the cost of inputs (X5) were significant at the 1% level.

The findings of this study revealed that up to 90% of the variation in the supply of local rice was accounted for by the independent variables. The positive coefficients for the price of imported rice (X1) and the price of sorghum (X3) indicate that as the prices of imported rice (X1) and sorghum (X3) rise, demand shifts from imported rice and sorghum to local rice, consequently increasing its supply. Thus, both imported rice (X1) and sorghum (X3) are substitutes for local rice. The own price coefficient was

positive, indicating that an increase in the price of locally supplied rice leads to an increase in its supply, which aligns with the law of supply. The negative signs of the price of maize (X4) and the cost of inputs (X5) imply that a decrease in the price of maize results in a decrease in its supply, which subsequently increases the supply of local rice. This finding contradicts the study's expectations; however, within the study region, maize is perceived as an inferior good due to the local belief that it is detrimental health-wise. If marketing costs for rice increase, it is anticipated that the price of rice will rise, resulting in a demand shift towards its substitutes, thus reducing the supply of local rice. Therefore, this outcome correlates with Nwall and Maureen (2019), which suggests that the price of rice positively influences the quantity of locally supplied rice, while rice imports negatively affect it. This implies that a higher level of rice imports leads to a decrease in the price of imported rice, and consequently in the price of locally supplied rice, ultimately resulting in a lower quantity of locally supplied rice.

Table 1: Result of factors that affects the locally produced rce

Variables	Reg-coefficient	T-Value	F-value	R^2
Constant (a)	99958.6*	5.49	42.82	.9009
Price of imported rice (X_1)	29.290058**	2.467		
Price of local rice (X_2)	-67943.12	0.277		
Price of Sorghum (X_3)	57.13743**	2.220		
Price of Maize (X_4)	-70.598332**	-2.881		
Cost Marketing inputs(X_5)	-4737.95861*	-5.495		

(Source: Field Survey, 2024).

*Significant at 1% level; **Significant at 5% level; ***Significant at 10% level

To assess the level of substitution between locally grown rice, imported rice, sorghum, and maize, Table 2 displays the price elasticity of supply for these commodities. The own price elasticity coefficient of 0.49 suggests that a 1% increase in the price of locally supplied rice resulted in a less than proportional change in its supply. Consequently, the supply of local rice is considered price inelastic in the examined region. In contrast, the gross price elasticity coefficients of 2.09 for imported rice and 4.08 for sorghum indicate that a 1% change in the price of local rice caused a more than proportional change in the supply of both imported rice and sorghum. This signifies that the three crops are substitute goods; fluctuations in the price of any of these crops will influence the supply of the others. Hence, suppliers are able to adjust their supply preferences among these three commodities based on their relative prices. This finding aligns with the research conducted by Tolorunju and Oladeji (2017), which highlights the presence of cross-price elasticities between rice and its substitutes in western Nigeria.

Table 2: Price elastic of rice supply in the study area

Commodity	Own price	Gross price
Imported rice		2.09
Locally supplied rice	0.49	
Sorghum		-5.04
Maize		4.08

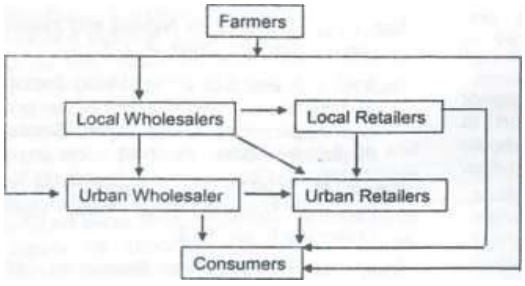
(Source: Field Survey, 2024)

This study on local rice supply found that rice typically changes hands at least three times before reaching the final consumer, as illustrated in Figure 1.

This finding supports the conclusions of Tolorunju and Oladeji (2017), which indicated that commission agents travel to farms and primary and feeder markets to gather supplies, subsequently transporting the commodities south via rail or truck to their principals in Ibadan markets. Wholesalers then sell to other wholesalers or retailers operating in the same or different

markets both within and outside of Ibadan. Furthermore, rice and cowpea are typically transferred at least three times prior to reaching consumers in northern Nigeria. The involvement of various parties in agricultural marketing significantly contributes to the elevated prices of agricultural products, thereby resulting in substantial marketing margins. Olukosi and Isitor (1990) reported that marketing costs encompass the actual expenses incurred while carrying out the marketing functions as commodities transition from producers to the ultimate consumer.

Marketing Channels for Locally Supplied Rice: A survey conducted by Hays (1976) on millet and sorghum in the Zaria area of northern Nigeria revealed that there are ten potential distribution channels from the producer to the final consumer, encompassing the entire marketing system. Although each distribution channel on its own can lead the product to reach the final consumer, transporting goods from rural to urban areas typically involves multiple distribution channels to complete the marketing process. Tolorunju and Oladeji (2017) also noted that locally produced food items often pass through as many as six intermediaries before reaching consumers, contingent on the specific commodity. They emphasized that rice and cowpea usually change hands at least three times before reaching consumers in northern Nigeria.



Figures 1: Rice Marketing Channels (Source: Field Survey, 2024)

Challenges in Rice Marketing: The various issues impacting the local rice marketing sector in the study area are detailed in Table 3.

Table 3 indicates that the main challenges faced by retailers include inadequate storage facilities, lack of standardized units of measurement, and insufficient credit facilities. Among wholesalers, 50% highlighted the poor storage system, while 18% cited inadequate credit facilities as their significant challenges in rice marketing. These findings align with those of Idiong (2006) and Abbott and Makeham (1990), who noted that transportation issues, lack of appropriate pricing, inadequate processing and storage facilities, and the absence of standardized measures are common problems in agricultural marketing.

Table 3: Problems affecting rice marketing in the study area

Problems	Retailers		Wholesalers	
	No.	%	No.	%
Poor Price	17	16.35	9	12.16
Poor storage Facilities	26	25	37	50
Poor Transportation	17	16.35	9	12.16
Inadequate credit facilities	19	18.27	14	18.92
Unstandardized unit of measurement	25	24.04	5	6.26
Total	**100**	**100**	**60**	**100**

(Source: Field Survey, 2024)

5.0 Conclusion

Assessing the issues influencing the availability of locally produced rice in a few Katsina State local government areas was the goal of this study. Out of the four Local Government Areas (Daura, Dutsin-ma, Funtua, and Katsina), two marketplaces were selected for this assessment. The data gathered for this study was analysed using regression analysis and descriptive statistics. According to the study, the factors taken into account—prices of imported and local rice, maize, and sorghum—were responsible for around 90% of the fluctuation in the supply of locally produced rice. Forty percent of the entire rice supply is produced locally, thirty percent is purchased from wholesalers, and twenty-four percent is purchased from retailers. Furthermore, although direct sales from farmers to consumers do happen occasionally, the survey discovered that rice usually passes through at least four different

hands before reaching the final consumers. Poor pricing, a lack of standardized measuring units, inadequate storage facilities, and inadequate credit facilities are some of the issues that have been identified in the marketing of rice.

The study's conclusions lead to the following recommendations being put forth:

1. To increase market efficiency, the government should make sure that sufficient infrastructure is provided, such as better roads and market facilities.
2. To reduce dishonest activities in rice marketing, the government should work to standardise measuring units for rice nationwide.
3. To increase the supply of domestic rice, financial loans must to be made readily available to rice marketers.
4. Since the government might not be able to fully support rice marketers financially, wealthy marketers should help by lending money to other marketers who are in need.

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